

PATENT COOPERATION TREATY
PCT
INTERNATIONAL SEARCH REPORT
(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 12545090	<div style="display: flex; justify-content: space-between;"> <div style="text-align: center;">FOR FURTHER ACTION</div> <div style="text-align: right;">see Form PCT/ISA/220 as well as, where applicable, item 5 below.</div> </div>	
International application No. PCT/AU2004/001735	International filing date (day/month/year) 9 December 2004	(Earliest) Priority Date (day/month/year) 9 December 2003
Applicant THE AUSTRALIAN NATIONAL UNIVERSITY et al		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 6 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ The international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. ☐ With regard to any nucleotide and/or amino acid sequence disclosed in the international application, see Box No. I.

2. ☐ Certain claims were found unsearchable (See Box No. II).

3. ☒ Unity of invention is lacking (See Box No. III).

4. With regard to the title,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the **drawings**,

- a. the figure of the drawings to be published with the abstract is Figure No. 15

☒ as suggested by the applicant.

☐ as selected by this Authority, because the applicant failed to suggest a figure.

☐ as selected by this Authority, because this figure better characterizes the invention.

- b. ☐ none of the figures is to be published with the abstract.

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Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:

because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:

because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:

because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

See extra sheet.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☒ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

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A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. ⁷: G11C 11/34, G11B 9/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
 DWPI, USPTO, DWPI, IEEE, internet (silicon, amorphous, crystalline, a-Si, c-Si, IPC: G11-, phase, indentation, pressure, memory, etc.)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	P. Vettiger et al, <i>The "Millipede" - Nanotechnology Entering Data Storage</i> IEEE Transactions on Nanotechnology, 1(1), pp. 39-55, 2002	1-4, 12-15, 25-26, 35-36, 48
X	US 5,835,477 A (BINNIG et al), 10 November 1998 the whole document	1-4, 12-15, 25-26, 35-36, 48
X	WO 2002/077988 A2 (INTERNATIONAL BUSINESS MACHINES), 3 October 2002 the whole document	1-4, 12-15, 25-26, 35-36, 48
X	M. Durandurdu et al, <i>High-Pressure phases of Amorphous and Crystalline Silicon</i> Physical Review B, 67(21), June 2003	25-28, 33-36



Further documents are listed in the continuation of Box C



See patent family annex

* Special categories of cited documents:

"A"	document defining the general state of the art which is not considered to be of particular relevance	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E"	earlier application or patent but published on or after the international filing date	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O"	document referring to an oral disclosure, use, exhibition or other means	"&"	document member of the same patent family
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search
8 February 2005

Date of mailing of the international search report
15 FEB 2005

Name and mailing address of the ISA/AU

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C (Continuation).

DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	T. Juliano et al, <i>Effect of Indentation Unloading Conditions on Phase Transformation Induced Events in Silicon</i> Journal of Material Research, 18(5), pp. 1192-201, May 2003	25-28, 33-36
X	V. Dornich et al, <i>Phase Transformations in Silicon Under Contact Loading</i> Reviews of Advanced Materials Science, 3(1), pp. 1-36, 2002	25-28, 33-36
X	M. Durandurdu et al, <i>Pressure-Induced Structural Phase Transition of Paracrystalline Silicon</i> Physical Review B, 66(20), November 2002	25-28, 33-36
X	J. S. Williams et al, <i>Mechanical Property Characterisation of Crystalline, Ion Implantation Amorphised and Annealed Relaxed Silicon with Spherical Indenters</i> Proc. Materials Research Society Symposium, 308, pp. 571-6, 1993	27-28, 33-36, 47
X	US 2003/0219937 A1 (PETERSON et al), 27 November 2003 the whole document	39, 47, 49
X	DWPI Abstract Accession No. 1993-141035, RD 347074 A (ANON), 20 March 1993	39, 40, 42, 47, 49
X	US 5,307,311 A (SLIWA, JR.), 26 April 1994 the whole document (column 23, lines 16-26 in particular)	40, 42, 47
X	US 2003/0214857 A1 (HORIE et al), 20 November 2003 the whole document	47
& X	DE 100 29 593 A1 (INTERNATIONAL BUSINESS MACHINES), 18 January 2001 US 6,665,258 B1 (DIETZEL et al), 16 December 2003 column 8, lines 7-54	40, 42
X	H. Kado et al, <i>Nanometer-Scale Recording on Chalcogenide Films with an Atomic Force Microscope</i> (abstract) Applied Physics Letters, 66(22), pp.2961-2, May 1995	40, 42
X	US D451,957 S (TRENTI), 11 December 2001 the whole document	1

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Supplemental Box

(To be used when the space in any of Boxes I to VIII is not sufficient)

Continuation of Box No: III

The international application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept. In coming to this conclusion the International Searching Authority has found that there are many inventions:

1. Claims 1-17, 25-26, 35-36, 48. The independent claims in this group contain no "special technical features." (The application and removal of pressure to a substance to store information is extremely well-known, and cannot constitute a "special technical feature.")
2. Claims 18-24, 29-32, 46. The pressure-induced phase change between relaxed amorphous silicon and crystalline silicon is considered to be a first "special technical feature."
3. Claims 27-28. The use of pressure to induce a phase change in a substance is a second "special technical feature."
4. Claim 33. The use of pressure to create regions of crystalline and amorphous silicon on a silicon substrate is a third "special technical feature."
5. Claim 34. The use of pressure to create regions of different electrical/physical properties on a silicon substrate is a fourth "special technical feature."
6. Claims 37-38, 45. The use of pressure to induce a change in conductivity is a fifth "special technical feature."
7. Claims 39, 49. The presence of regions of crystalline silicon in a layer of relaxed amorphous silicon is a sixth "special technical feature."
8. Claims 40-44. The use of regions of differing conductivity to store information is a seventh "special technical feature."
9. Claim 47. The changing of an electrical property of silicon to store information is an eight "special technical feature."

Since the abovementioned groups of claims do not share any technical features, a "technical relationship" between the inventions, as defined in PCT rule 13.2 does not exist. Accordingly, the international application does not relate to one invention or to a single inventive concept.

INTERNATIONAL SEARCH REPORT

Information on patent family members

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This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report			Patent Family Member			
US	5835477	NONE				
WO	02077988	EP	1371062	US	2004136277	
US	2003219937	WO	03098664			
US	5307311	JP	4289580	US	5216631	
US	2003214857	CN	1442853	EP	1343154	JP 2004203011
US	6665258	DE	10029593			
US	D451957	US	D450087			
Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.						
END OF ANNEX						

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